ProSoft TECHNOLOGY

Where Automation Connects.

# Wireless I/O System

April 20, 2015

## USER GUIDE

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Wireless I/O System User Guide
April 20, 2015

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# 1 Preface

Thank you for choosing the Wireless I/O System - an intelligent, bi-directional wireless I/O mirroring solution that is ideal for replacing hardwire and conduit or for implementing it into new infrastructures. The Wireless I/O System requires no software or programming and is extremely easy to install and use. It's the easiest way from point A to point B, and back.

This document is designed to guide you through setting up the system by familiarizing you with the hardware, installation, wiring, and overall system management. This guide also provides how to use the Wireless I/O System's Advanced User Interface.

If you have any questions about this product, please call or email:

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**Warning:** Ensure the installation of the system meets applicable state and national electrical code requirements. The installation of the system should only be performed by a qualified installer or a factory representative.

**Warning:** To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

**Warning:** Power must be disconnected or turned off prior to attaching or removing any I/O Modules from the system – failure to comply may cause damage to the I/O Module(s).

## 1.1 Compliances

- This device MUST be professionally installed by a factory representative or a trained authorized technician.
- Changes or modifications not expressly approved by the manufacturer may void the user's authority to operate the equipment.
- This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: 1) this device may not cause harmful interference, and 2) this device must accept any interference received, including interference that may cause undesired operation.
- To reduce potential radio interference to other users, install and use only the antenna supplied by the manufacturer to ensure successful communications.

*FCC RF Exposure*

To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

*FCC Interfere*

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful communications to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the antenna.
- Increase the separation between the equipment and receiver.
- Consult the manufacturer for technical help.

This equipment has been certified to comply with the limits for a class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or use of unshielded cables is likely to result in interference to radio and television reception. The user is cautioned that changes or modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

# 2 System Overview

## 2.1 Highlights

- Wireless hardwire replicator / rapid reliable wireless connectivity.
- Save money and time: Wireless I/O System eliminates trenching and running conduit / deploys in minutes.
- Easy to use: no software configuration needed.
- Easy to install: mounts onto a 35 mm DIN rail without any tools.
- Flexible: place inputs and output on both ends of radio.
- Customize I/O using Digital, 0-10 V, and/or 4-20 mA options.
- Isolated: each Module provides field isolated inputs and outputs.
- 24-bit high-resolution Analog inputs.
- Fast response time: 1 second default / turbo-mode up to 100 ms depending on number of connection I/O Modules.
- RF and I/O fail detection: NPN outputs on Radio Modules.
- Secure: factory paired, secure Radio System (128-bit AES) keeps network protected
- Less wire clutter: single power termination per station.
- Wiring label on each device for quick reference.
- Color-coded labels for easy device identification.
- FailSafe: user can defines how outputs are failed over when RF or I/O communication is ever lost.
- FailSafe output modes:
  Digital: On, off, last known value (default)
  Analog: Any value on scale (Advanced UI required), last known value (default)
- Provides manual FailSafe override function via dry contact input on Radio Module.
- Wireless I/O System can support multiple I/O Modules.
  System can support up to sixteen (16) Digital Modules max.
  System can support up to eight (8) 0-10 V Modules max.
  System can support up to five (5) 4-20 mA Modules max.

**Warning:** When adding more than five (5) I/O Modules and creating different I/O Module combination, please determine maximum allowable I/O Module combination per system by utilizing the power budget calculator. See http://psft.com/A5D

## 2.2 Ease of Use

When faced with having to replace an existing hardwired system or installing new infrastructure, the Wireless I/O System is the fastest, easiest, and most economical methods for wirelessly duplicating discrete, 4-20mA, or 0-10V signal wire. All I/O Modules feature isolated inputs and outputs. The Wireless I/O System requires no configuration or software and is extremely quick and easy to install. The Wireless I/O System mounts to 35 mm DIN rail. Then, you just need a screwdriver and a wire stripper to terminate input, outputs, and power.

## 2.3 Faster Deployment and Less Maintenance

Significant amount of time and money can be saved by avoiding permitting and trenching to run wires. Because deployment time is so rapid using the Wireless I/O System, you can even use it as an emergency backup system when a hardwired system is down for repair or maintenance. And by removing the hardwire run, it also eliminates the potential cost for future wire failure replacement and maintenance due to natural disasters such as lightning. Troubleshooting also become much easier and quicker with the Wireless I/O System since there are less points of failure than a hardwire system.

## 2.4 Faster, Smarter, Secure, Failsafe

In the Wireless I/O System, the Radio Modules control and power everything. They manage all signal traffic and provide critical alarms and diagnostics when either RF link failure or I/O mismatch is detected and trigger NPN digital outputs for notification. At the same time, the Radio Module overrides all outputs into the user's predetermined FailSafe output states on each I/O Module. Each output is independently controlled. It also provides the ability to locally force outputs when setting up the system without needing a real signal source. The paired Radio Modules communicate at a default response time of 1 second.

The Radio Modules can be put to Turbo Tx mode and the response time varies with the number of connected I/O Modules, up to 100 ms. The Radio Modules utilize AES encryption for securely delivering data and are offered in 900 MHz or 2.4 GHz (license-free ISM), in both domestic (US) and international versions. Antennas and antenna cables are sold separately so that you can select the appropriate antenna and cable lengths to fit your application.

## 2.5 Customer, Scalable I/O Expansion

The Radio Kit is the foundation of the Wireless I/O System that allows you to build your custom I/O solution. The two (2) factory-paired Radio Modules are packaged in the Wireless I/O Radio Kit. The Kit also includes all the mounting hardware so you simply need to add the I/O Modules of your choice. Up to five (5) pairs of I/O Modules of any kind can be operated using the Radio Kit. If additional I/O Modules are needed for expansion, the Wireless I/O System can support many more pairs of I/O Modules using a longer DataRail.

## 2.6 Advanced Features

The Wireless I/O System also offers an Advanced User Interface for PC. By connecting the PC to the Radio Module's mini-USB port, you can check vital system health such as RSSI (Received Signal Strength Indication), view input/output status, adjust transmit power level, and adjust RF timeout interval. You can also locally force local outputs, set FailSafe settings individually for analog outputs. Digital outputs are set using DIP switches that are physically on the device.

## 2.7 Hardware

1. Radio Module: BM-0900-RM1 (US), BM-0915-RM1 (Int),
   BM-2400-RM1 (US), BM-2410-RM1 (Int)
2. Digital Module: BM-D100-144 (US); BM-D100-244 (International)
3. 4-20 mA Analog Module: BM-A420-122 (US); BM-A420-122 (International)
4. 0-10 V Analog Module: BM-A010-122 (US); BM-A010-122 (International)

5. DataRail attaches onto 35 mm x 7.5 mm DIN rail (Standard length included in Radio Kit can support 1 Radio + 5 I/O Modules)
6. End Terminal Bracket for securing DataRail and Modules to DIN Rail
7. DataRail Cover for protecting empty DataRail slots

# 3 Specifications

## 3.1 Hardware and System

| HARDWARE & SYSTEM | |
|---|---|
| Unique System Features | Bi-Directional Wireless Communication System |
| | No Software or Programming Required |
| Maximum Network Capacity* | System can support up to sixteen (16) Digital Modules max<br>System can support up to eight (8) 0-10 V Modules max<br>System can support up to five (5) 4-20 mA Modules max<br><br>When adding more than five (5) I/O Modules and creating different I/O Module combination, please determine maximum allowable I/O Module combination per system by utilizing the power budget calculator. |
| Use Power Budget Calculator | http://psft.com/A5D |
| DIN Rail Mounting Compatibility | 35 mm x 7.5 mm DIN Rail |
| DataRail™ (Included with Radio Kit) | 6.1" / 156 mm - Supports Up Five (5) I/O Modules, |
| | Other Lengths Also Available |
| Module Slave ID Selection | 16-Position Rotary Switch |
| DataRail Mounting Hardware | 4-Claw Attachment to 35 mm DIN Rail |
| | with End Terminal Bracket |
| Built-In Mounting Hardware | Spring-Loaded Clip-On System |
| Wire Gauge | Solid / Stranded (AWG) 28-12 Gauge |
| Wire Rating | UL: 300 V RMS, 80 °C and 300 V, 105 °C |
| | CSA: 300 V RMS, 105 °C |
| Warranty | 2-Year Limited |

## 3.2 Safety and Compliance

| SAFETY & COMPLIANCE | RADIO |
|---|---|
| Operational Temperature | -40 °C to 85 °C / -40 °F to 185 °F |
| Ambient Temperature | -20 °C to 85 °C / -4 °F to 185 °F |
| Humidity | 0 to 99 %, Non-condensing |
| Degree of Protection / Housing Type | IP20 / Plastic |
| Hazardous Locations Classifications | Class I; Division 2 (Zone 2), Pending |
| RF Emissions | FCC Part 15/IC |

## 3.3 Radio Module

| RADIO MODULE 900 MHz or 2.4 GHz | |
|---|---|
| Frequency | 902-928 MHz or 2.4 GHz License-Free ISM Band |
| Antenna Connector Type | SMA (Female Connector) |
| Default Transmit Speed / Update | 1 Second |
| Turbo Tx Speed Based on | 1=100 ms, 2-3=200 ms, 4=250 ms, 5-6=333 ms, |
| # of I/O Modules | 7-11=500 ms, 12-16=1 second |
| Outdoor / Line of Sight Max Range | 900 MHz: 4 Miles (6.4 Km) / 2.4 GHz: 1 Mile (1.6 Km) / |
| (900MHz@250mW/2.4GHz@63mW) | 2.4 GHz International: 2500 ft (750 m) |
| Indoor / Urban Max Range | 900 MHz: 1000 ft (305 m) / 2.4 GHz: 300 ft (90 m) / |
| (900MHz@250mW/2.4GHz@63mW) | 2.4 GHz International: 200 ft (60 m) |
| Maximum Transmit Power | 900 MHz: 24 dBm (250 mW) / 2.4 GHz: 18 dBm (63 mW) / |
| (Adjustable by Software) | 2.4 GHz International: 10 dBm (10 mW) |
| Receiver Sensitivity | 900 MHz: -101 dBm / 2.4 GHz: -100 dBm |
| Spread Spectrum | 900 MHz: FHSS / 2.4 GHz DSSS |
| RF Security | 128-bit AES |
| Manual FailSafe Override | Yes, via Provided Dry Contact Input |
| RF Link Alarm Digital Output | 10-Second RF Timeout Trigger (NPN) - User Selectable |
| I/O Link Alarm Digital Output | I/O Mismatch, Bus or Module Failure (NPN) |
| RF Link Diagnostics (Left LED) | Green = RF Traffic / Yellow = RF Link Fail |
| I/O Link Diagnostics (Right LED) | Green = I/O OK, Modules Detected / Red = I/O Link Fail |
| Supply Voltage Range | 9 to 30 VDC (± 5 %) |
| Protection Against Polarity | Yes |
| Advanced User Interface Features | Test RSSI, Tx Power Adjustment, Force Local Output(s), |
| | Set FailSafe Parameters, and Additional Diagnostics |
| Power Consumption | 35 mA @ 12V AVG (10% Duty Cycle) |
| Kit Packaging Dimensions (WxHxD) | 5.5x10.1x2.8-in / 140x257x72mm |
| Net Dimensions | 0.7x3.9x4.5-in / 17.5x99x114mm |
| Kit Packaging Weight | 1.3 lbs / 590 g |
| Net Weight (Single Radio) | 0.3 lbs / 136 g |

## 3.4 Digital I/O Module

| DIGITAL I/O MODULE | |
|---|---|
| Number of Inputs | 4 |
| Number of Outputs | 4 |
| Isolation Voltage | 2500 V r.m.s. |
| Input Voltage Range | 3-30 VDC |
| Input Voltage Threshold | 1 Signal ("H"): > 2.3 VDC |
| | 0 Signal ("L"): < 1.1 VDC |
| Output Rating | 1 A Sink Current for |
| | Open-Drain Outputs / NPN |
| FailSafe Modes | On, Off, or Last Known Value (default) |
| Green LEDs | Line Driven Input Indicators |
| Red LEDs | Output Indicators |
| Power Consumption | Typical: 18 mA / Max: 26 mA @12 VDC |
| Packaging Dimensions | (WxHxD) 4.8 x 5.1 x 2.8-in / 123 x 129 x 72mm |
| Net Dimensions | 0.7 x 3.9 x 4.5-in / 17.5 x 99 x 114mm |
| Packaging Weight | Single: 0.5 lbs / 227 g; Double: 0.8 lbs / 363 g |
| Net Weight (Single) | 0.3 lbs / 136 g |

## 3.5 4-20 mA I/O Module

| ANALOG 4-20 mA I/O MODULE | |
|---|---|
| Number of Inputs | 2 (24-bit Resolution) |
| Number of Outputs | 2 (16-bit Resolution) |
| Isolation Voltage | 2500 V r.m.s. |
| Signal Range | 4 mA to 20 mA |
| Accuracy | < 0.28 % of Full Scale |
| Internal Loop Power | +13.5 VDC |
| AI Input Impedance (loop) | 128 Ohm |
| AO Terminal Voltage Range | 10 VDC Min. / 31.5 VDC Max. |
| Power Consumption | Typical: 50 mA / Max: 75 mA @12 VDC |
| FailSafe Modes | Any value on scale (Advanced UI required), or Last Known Value (default) |
| Packaging Dimensions | (WxHxD) 4.8 x 5.1 x 2.8-in / 123 x 129 x 72mm |
| Net Dimensions | 0.7 x 3.9 x 4.5-in / 17.5 x 99 x 114mm |
| Packaging Weight | Single: 0.5 lbs / 227 g; Double: 0.8 lbs / 363 g |
| Net Weight (Single) | 0.3 lbs / 136 g |

## 3.6 0-10 V I/O Module

| ANALOG 0-10 V I/O MODULE | |
|---|---|
| Number of Inputs | 2 (24-bit Resolution) |
| Number of Outputs | 2 (16-bit Resolution) |
| Isolation Voltage | 2500 V r.m.s. |
| Signal Range | 0 VDC to 10 VDC (10.5 V Max) |
| Accuracy | < 0.1 % of Full Scale |
| AI Input Impedance | 40K Ohm |
| AO Output Impedance | 10 Ohm |
| Power Consumption | Typical: 40 mA / Max: 45 mA @12 VDC |
| FailSafe Modes | Any value on scale (Advanced UI required), or Last Known Value (default) |
| Packaging Dimensions | (WxHxD) 4.8 x 5.1 x 2.8-in / 123 x 129 x 72mm |
| Net Dimensions | 0.7 x 3.9 x 4.5-in / 17.5 x 99 x 114mm |
| Packaging Weight | Single: 0.5 lbs / 227 g; Double: 0.8 lbs / 363 g |
| Net Weight (Single) | 0.3 lbs / 136 g |

## 3.7 Ordering Information

| ORDERING INFORMATION | |
|---|---|
| Radio Kit | US/N.Am: 900 MHz BM-0900-RM1K |
| | US/N.Am: 2.4 GHz BM-2400-RM1K |
| | Intl: 900 MHz BM-0915-RM1K |
| | Intl: 2.4GHz BM-2410-RM1K |
| Radio Kit Content | 2x Radio Modules (Factory Paired) |
| | 2x DataRails, 4x End Terminal Brackets |
| | 2x DataRail Covers, USB to Mini USB Cable |
| | Quick Start Guide |
| Digital I/O | 1-Pack: BM-D100-144S |
| | 2-Pack: BM-D100-144D |
| 4-20 mA I/O | 1-Pack: BM-A420-122S |
| | 2-Pack: BM-A420-122D |
| 0-10 V I/O | 1-Pack: BM-A010-122S |
| | 2-Pack: BM-A010-122D |

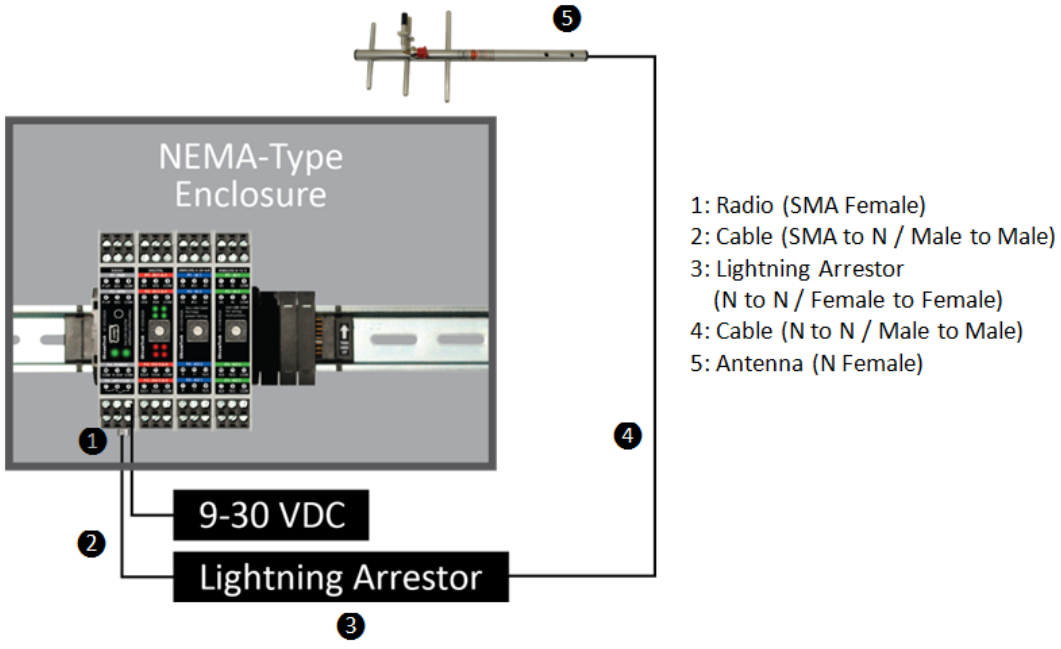
# 4 Installation

## 4.1 Outdoor Enclosure Installation

1. Install or use an existing outdoor NEMA-type enclosure.
2. Be sure the Wireless I/O System meets applicable grounding requirements.
3. Install a 35 mm x 7.5 mm DIN rail (at least 166 mm (6.5-inch) wide) inside the enclosure.
4. Provide external power supply: 9-30 VDC.
5. Provide antenna and antenna cable to connect to Wireless I/O Radio Module.

a. There are various types of antennas including bulkhead, omni, and yagi. Please use the appropriate type for your application.

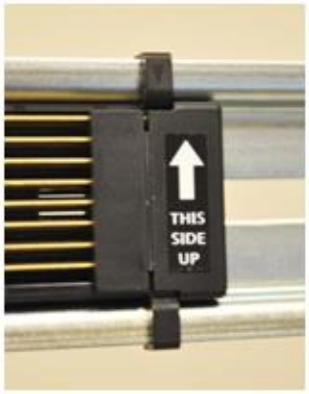
6. Connecting a lightning arrestor is highly recommended.
7. Install antenna (performing a RF site survey prior to installation is highly recommended).
8. Make a hole on the bottom of the enclosure to run wires.
9. Run conduit for power and antenna cable.
10. Connect antenna cable to antenna and then feed cable into enclosure.
11. Feed power wiring into enclosure.
12. Repeat above steps for other site locations.



## 4.2 Wireless I/O System Assembly (attach from left to right)

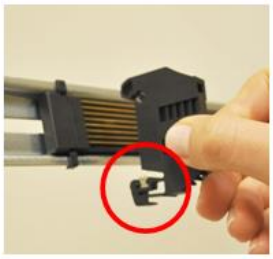
**Warning:** Power must be disconnected or turned off prior to attaching or removing any I/O Modules from the system – failure to comply may cause damage to the hardware.

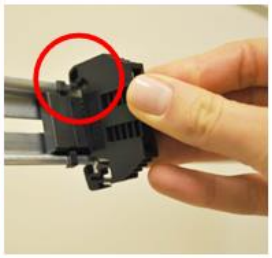
1. Securely attach DataRail onto a 35 mm x 7.5 mm DIN rail by gently pressing on all four (4) corner clips.




2. Secure DataRail to DIN rail by attaching an End Terminal Bracket.

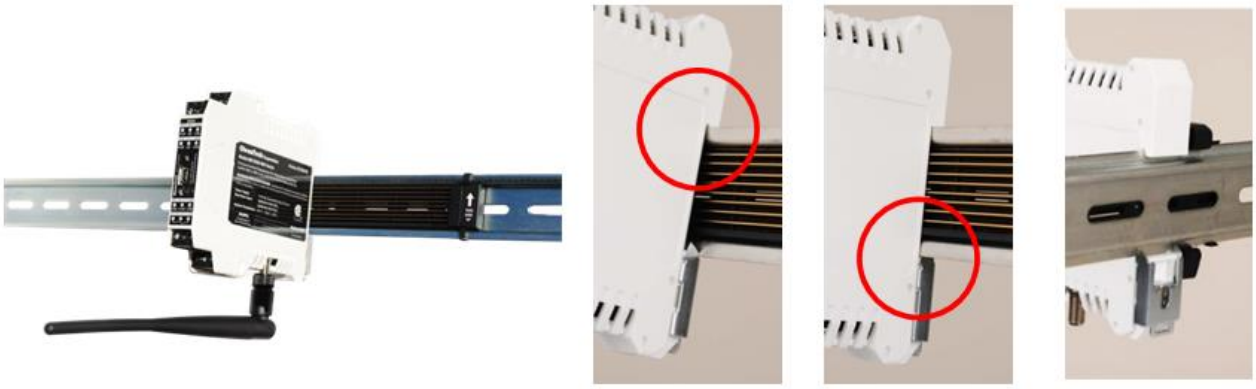
   a. First, hook the metal end of the Bracket to DIN rail and then snap the other end onto DIN rail into place. (Make sure to position the Bracket on the far left of the DataRail where the metal blades meet the plastic).



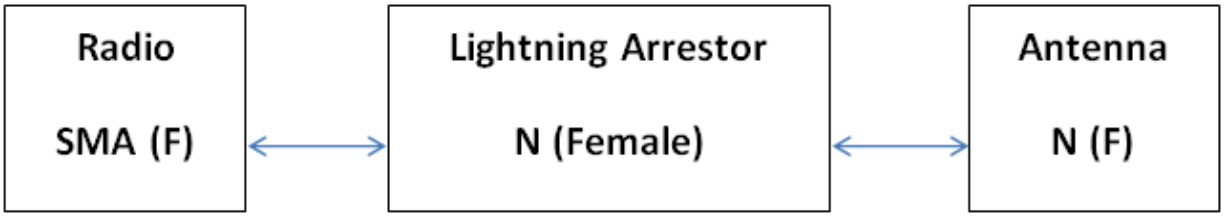


3. Attach Radio Module to DataRail (next to the Bracket without any gap).

   a. First, latch the top hook onto the rail, then snap in the spring-loaded clip into place.



   b. Connect Antenna. The Radio Module is equipped with a SMA (female) connector. For outdoor installation, place a lightning arrestor between Antenna and Radio Module connection.




4. Attach I/O Module(s) to the system.

   a. Place Modules in any combination (do not leave gaps between Modules).

   b. When using more than five (5) I/O Modules, determine maximum I/O Module combination by using power budget calculator. http://psft.com/A5D

c. Use the 16-position switch located on the front of each I/O Module to set device ID(s). Each pair of Modules must have a unique ID.

5. Attach the other End Terminal Bracket to secure the Modules (place it next to the last module without leaving a gap).

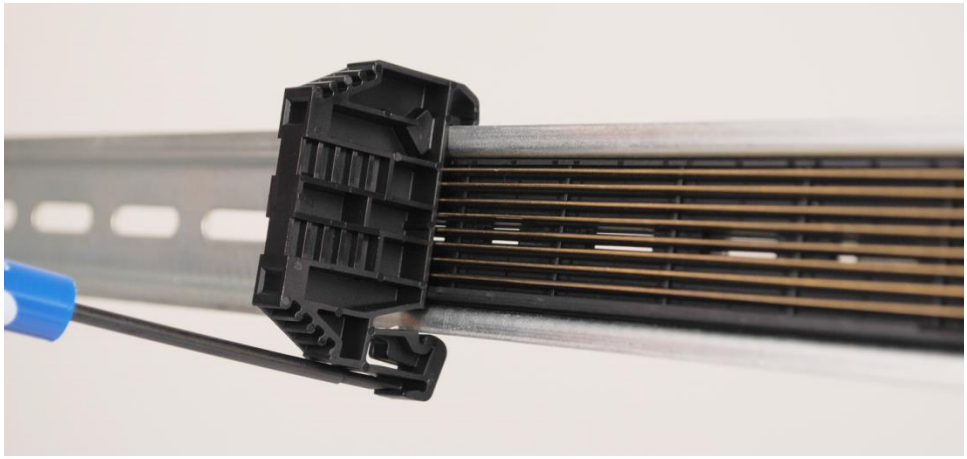
6. Protect any unused DataRail slots with a cover. Snap-off extra pieces and store for future use.

7. Terminate the I/O and supply power as required. Use solid or stranded wire (AWG) 28-12.

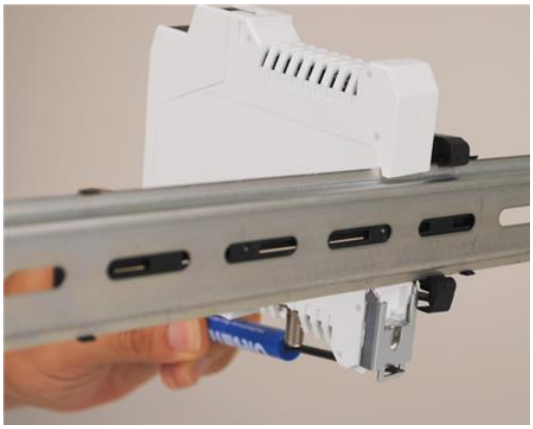
## 4.3 Detaching Components from the DataRail

**Warning:** All live wiring connections and power must be safely disconnected before taking any components off the DataRail or Wireless I/O System!

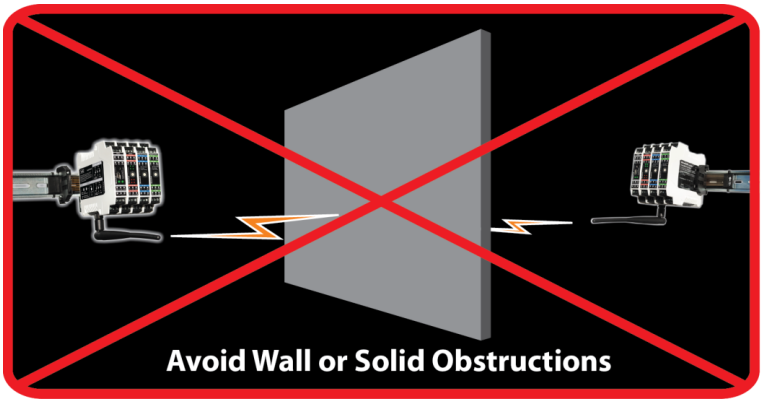
1. The End Terminal Bracket can be removed from DIN rail by inserting the tip of a flathead screwdriver into the removal slot. Control the direction with the screwdriver handle to pull the latch away from the DIN rail for safe removal.

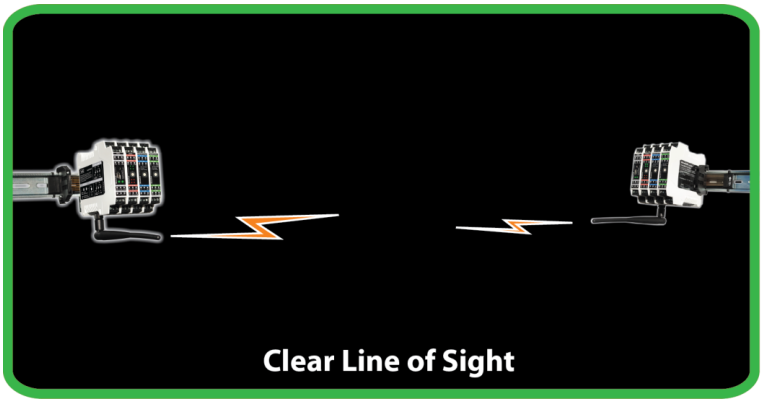


2. Wireless I/O Modules can be removed from the DIN rail by inserting the tip of a flathead screwdriver into removal slot located on the metal clip. Lift-up on the screwdriver handle to pull the spring-loaded clip away from the DIN rail for safe removal.



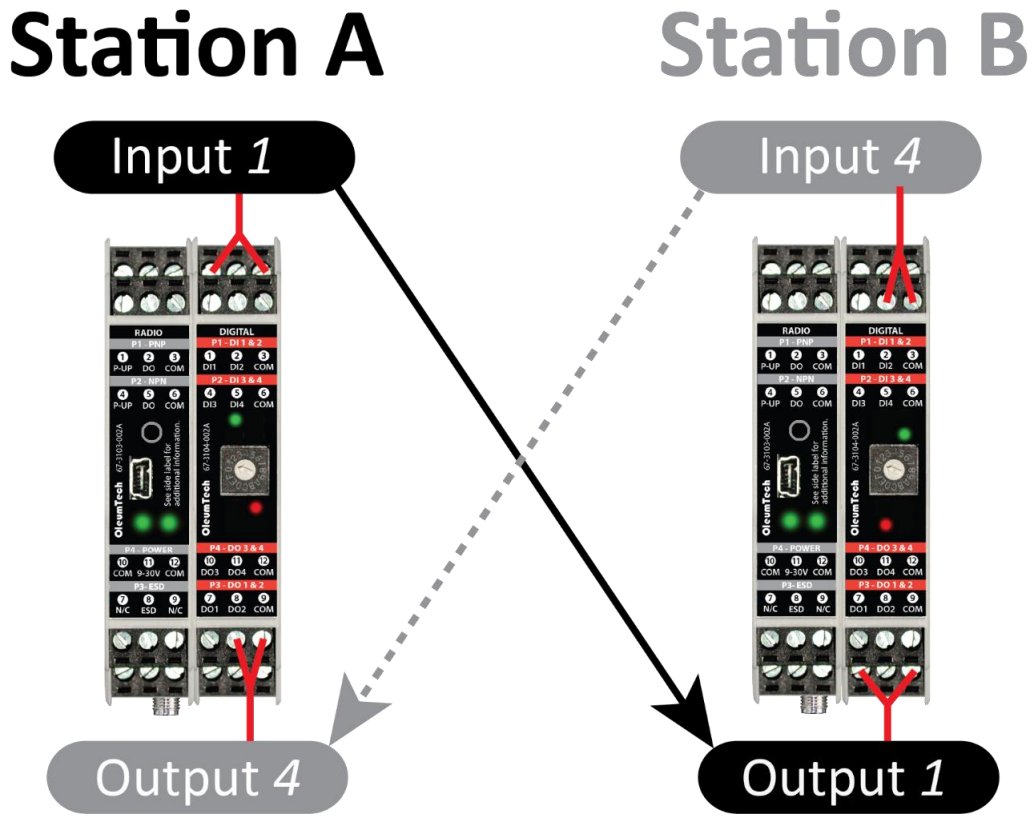
# 5 Radio Setup



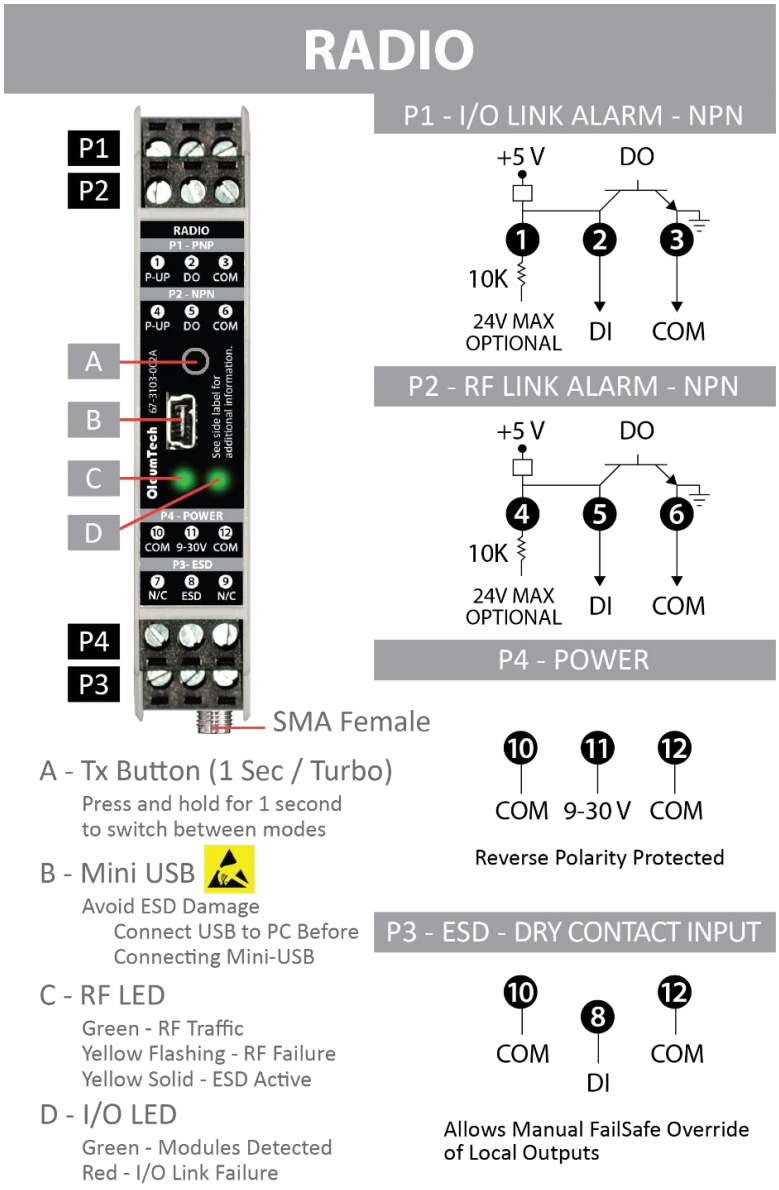

1. When installing antennas, avoid walls, tall buildings, trees, and other solid obstructions for improving RF signal quality.
2. Having a clear line of sight between antennas is ideal for best RF signal quality.
3. Use the appropriate antenna and use high quality antenna cables with the Wireless I/O System for best performance.
4. After the entire system is installed, verify if the RF LED on Radio Module is green, which serves as indication for good RF traffic.
5. Advanced: Run an RSSI test. Connect a PC to the Radio Module's mini USB port and utilize the Wireless I/O System Advanced Software to evaluate Received Signal Strength. In general, achieving above -85 dBm is recommended for signal quality. In an environment with low interference, 90-100% packet throughput can be achieved at lower levels, as low as -100 dBm.

# 6 Signal Chain Diagram



# 7 Wiring Diagrams

## 7.1 Radio Module (BM-0900-RM1 Shown)




Connect I/O Link Alarm output to report when there is an I/O link failure. Once the failure is corrected, you must reset power.

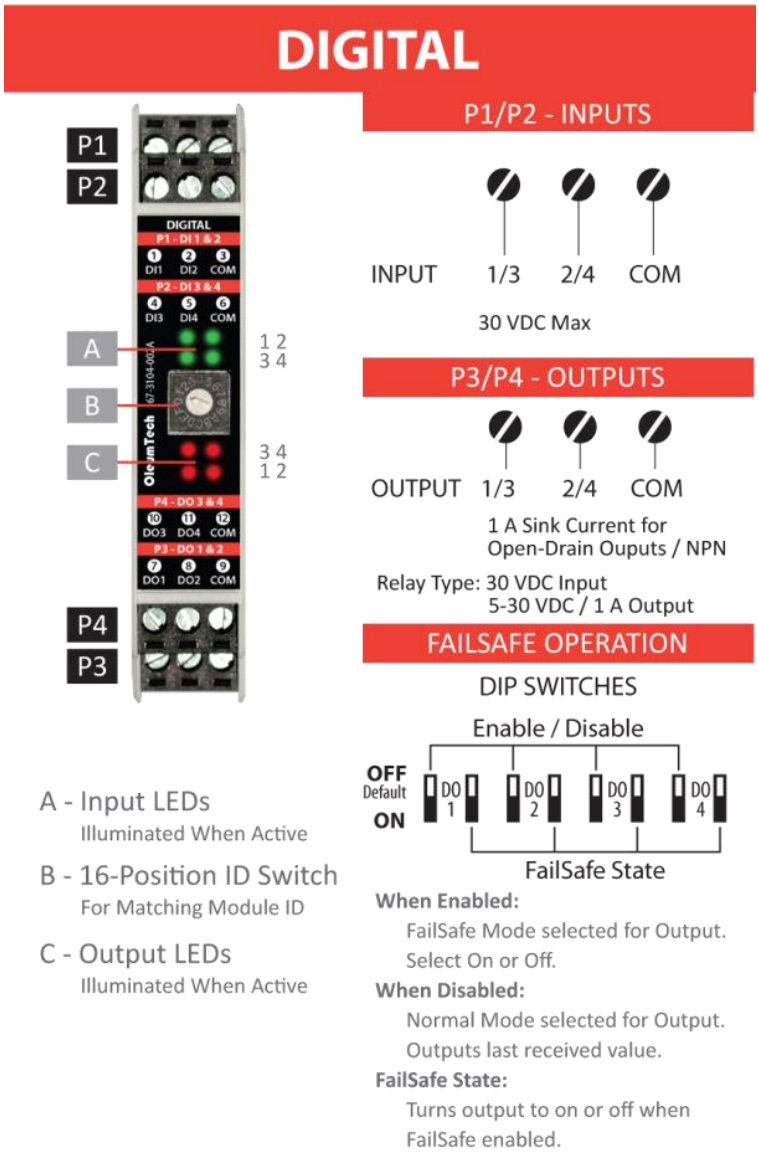
Connect RF Link Alarm output to report when there is an RF link failure.

This Input allows connection of a dry contact switch for manually overriding system into FailSafe state for all outputs.

Use Solid / Stranded (AWG) 28-12 Wire Gauge

Radio Module does not share a common ground with I/O Modules.
All inputs and outputs on I/O Modules provide field isolation.

## 7.2 Digital Module (BM-D100-144 Shown)

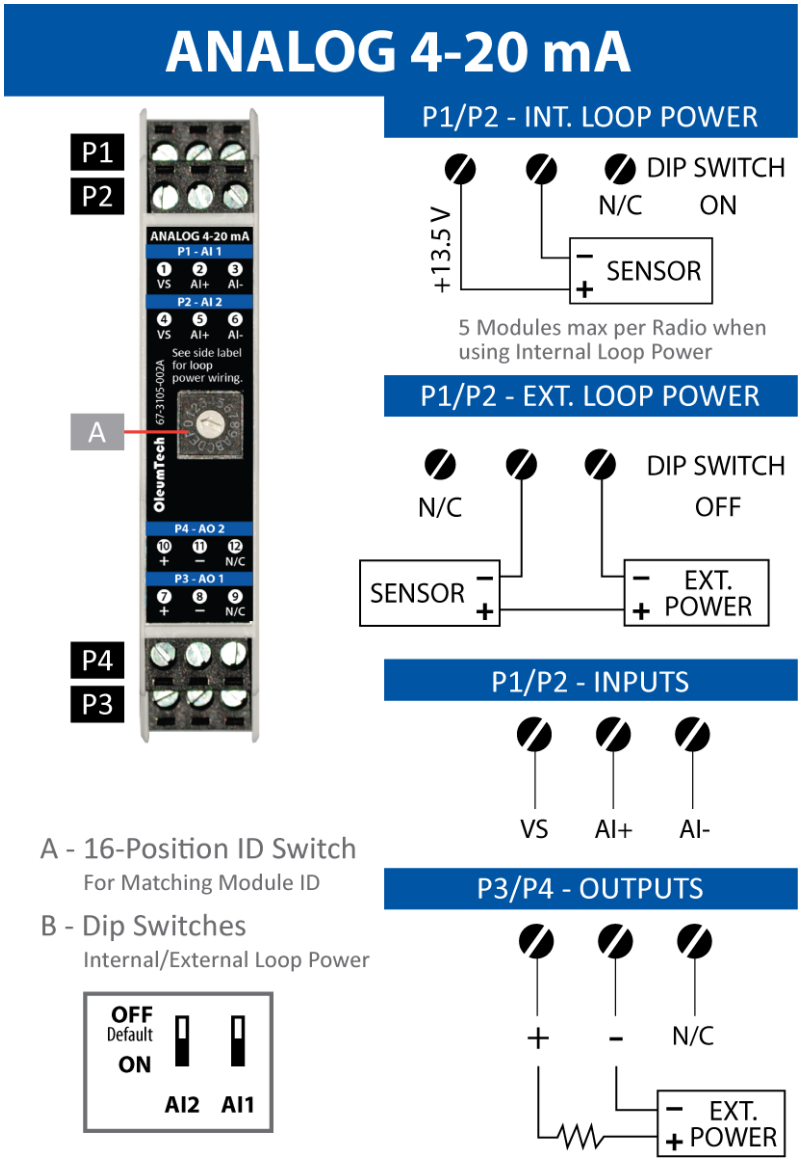



Use Solid / Stranded (AWG) 28-12 Wire Gauge

Digital I/O Module does not share a common ground with Radio Module.
All inputs and outputs on I/O Modules provide field isolation.

If input sensor is powered from the same source as Radio Module, be sure to establish a common ground, otherwise sensor will not work properly.

## 7.3 Analog 4-20 mA Module (BM-A420-122 Shown)

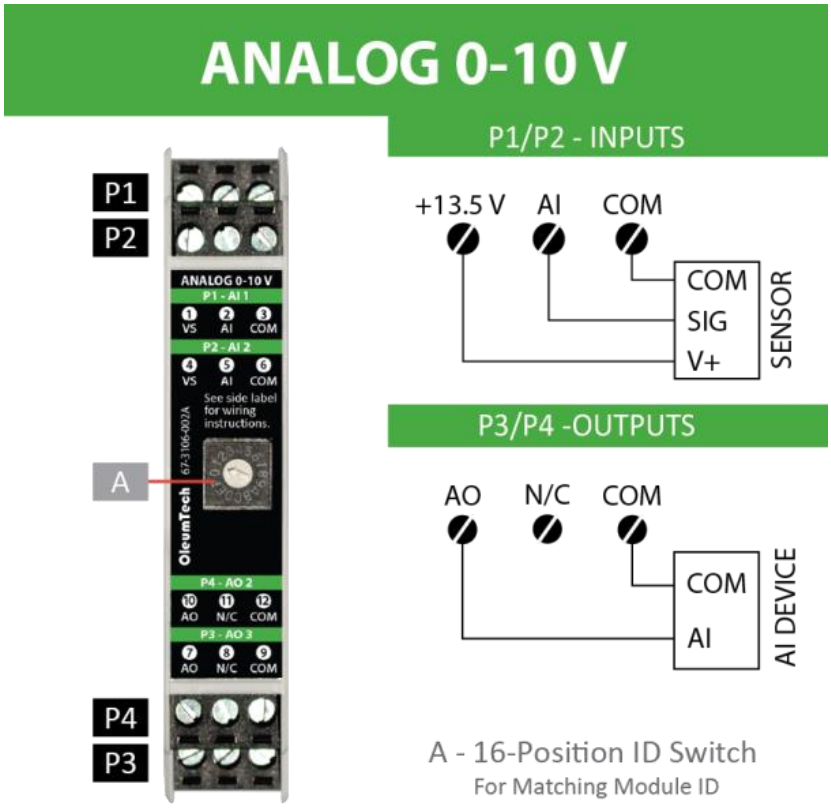



VS/External Power (min) = 10 + Max Current (Amp) * $R_{loop}$
$R_{loop}$ = Total Loop Impedance

Use Solid / Stranded (AWG) 28-12 Wire Gauge

4-20 mA I/O Module does not share a common ground with Radio Module. All inputs and outputs on I/O Modules provide field isolation.

## 7.4 Analog 0-10 V Module (BM-A010-122 Shown)




Use Solid / Stranded (AWG) 28-12 Wire Gauge

0-10 V I/O Module does not share a common ground with Radio Module.
All inputs and outputs on I/O Modules provide field isolation.

# 8 Diagnostics

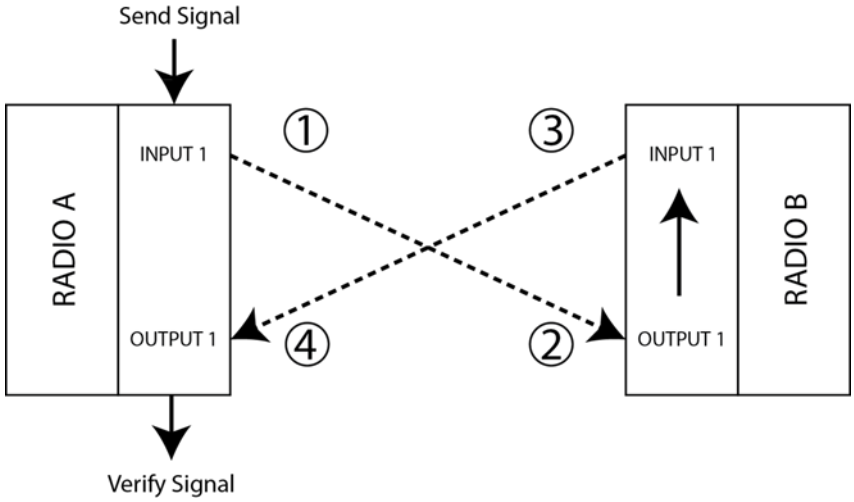
## 8.1 Radio Module

1. **RF LED (Left)**:
2. **Green**: RF traffic / data rate
    a. **Yellow**: RF link failure

        i. Indication of RF link failure after 10 second RF timeout and showing the Wireless I/O System is operating in FailSafe mode.
        ii. RF Link Alarm Output (P2 - NPN) is triggered to report failure status.
        iii. Check antenna connections and power at both Radio stations.
        iv. Check for clear line of sight, any obstruction in the path may negatively impact RF signal quality.

3. **I/O LED (Right)**:
    a. **Green**: Modules detected, I/O ok
    b. **Red**: I/O link failure

        i. Visual indication of I/O link failure.
        ii. I/O Link Alarm Output (P1 – NPN) is triggered to report failure status.
        iii. Functioning I/O will perform normally under alarm condition.
        iv. Any mismatched I/O Modules will be put to FailSafe mode.
        v. Check for I/O mismatch – check each pair of Modules is set to its own ID.
        vi. Check both Radio Stations have matching Modules.
        vii. Check DataRail condition – check for any sign of wear, debris, oxidation.
        viii. For signal integrity verification, perform Remote Loop Back diagnostics by wiring the based on diagram below.

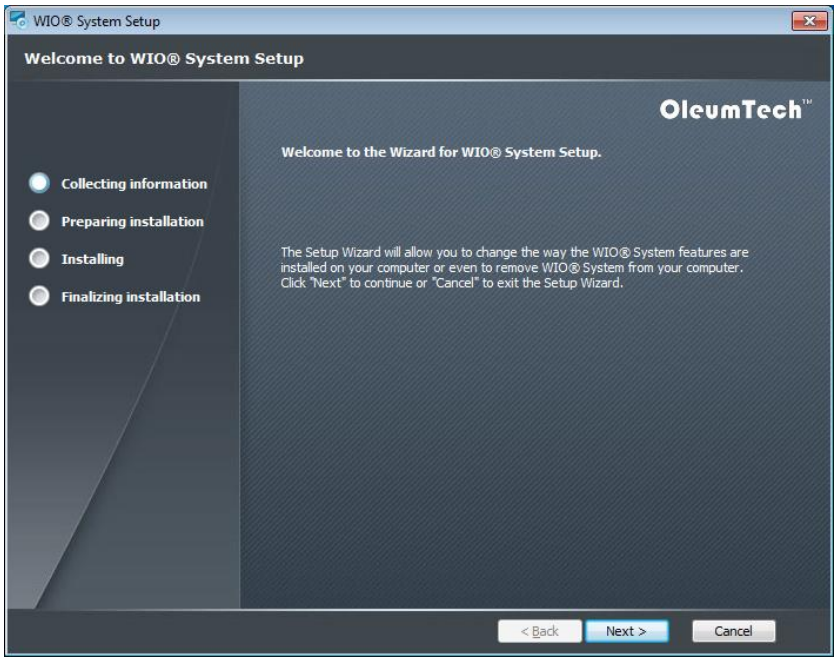

Send Signal
RADIO A
INPUT 1
OUTPUT 1
Verify Signal
①
②
③
④
INPUT 1
OUTPUT 1
RADIO B

# 9 Advanced User Interface for PC

Wireless I/O System Advanced User Interface is not required to operate or configure the system. This software is intended for users that want to take advantage of all the features available on the Wireless I/O System.

## 9.1 Download and Install Software

1. Download the latest version of the software from the ProSoft Technology web site http://psft.com/A5D
2. Install the software and follow the setup guide.


WIO® System Setup
Welcome to WIO® System Setup
OleumTech™
Welcome to the Wizard for WIO® System Setup.
Collecting information
Preparing installation
Installing
Finalizing installation
The Setup Wizard will allow you to change the way the WIO® System features are installed on your computer or even to remove WIO® System from your computer. Click "Next" to continue or "Cancel" to exit the Setup Wizard.
< Back
Next >
Cancel

3. Run the program.

## 9.2 Connect USB to Mini USB Cable (Included with Radio Kit)

1. First, connect USB end to PC.
2. Connect Mini-USB to Radio Module's Mini USB port.
3. Wait for the completion of driver installation on PC (May take up to a few minutes).

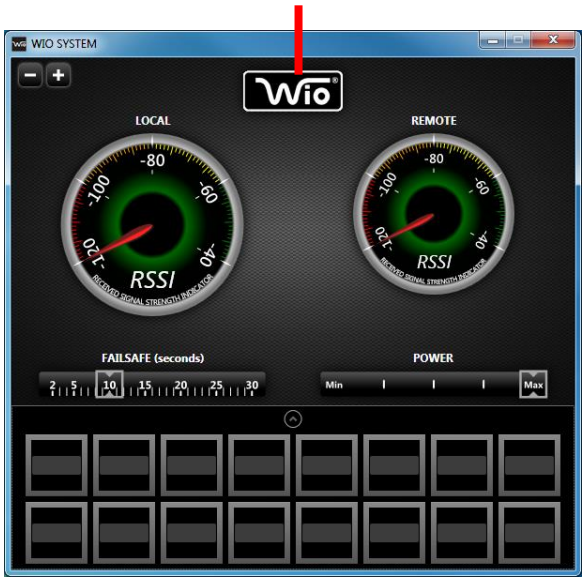
**Avoid ESD damage!**
-Always connect Mini-USB LAST.
-Always disconnect Mini-USB FIRST.

## 9.3 View of Graphic User Interface (GUI)

**OFF** - When PC is not connected to a Radio Module, all gauges and controls are disabled.

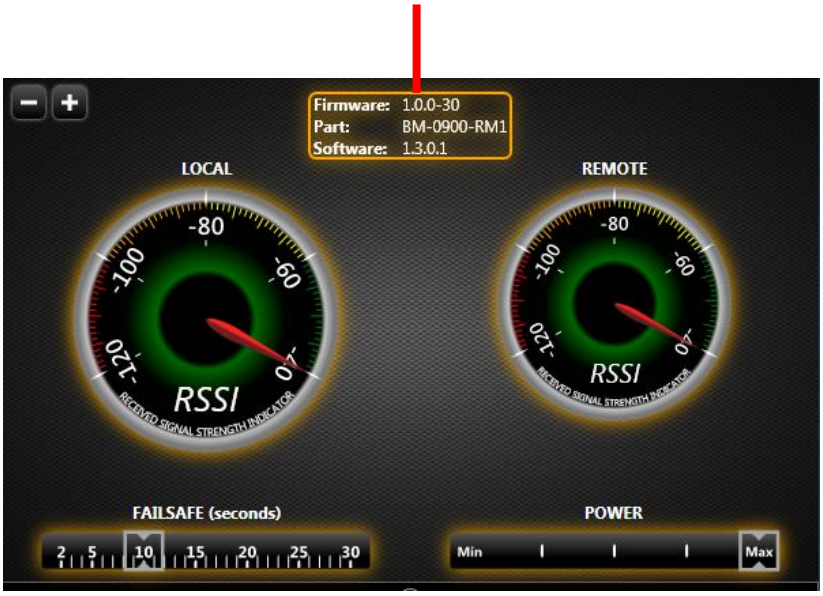
**ON** - When PC is connected to a Radio Module (powered on), all gauges and controls will be enabled.

**OFF / DISCONNECTED**

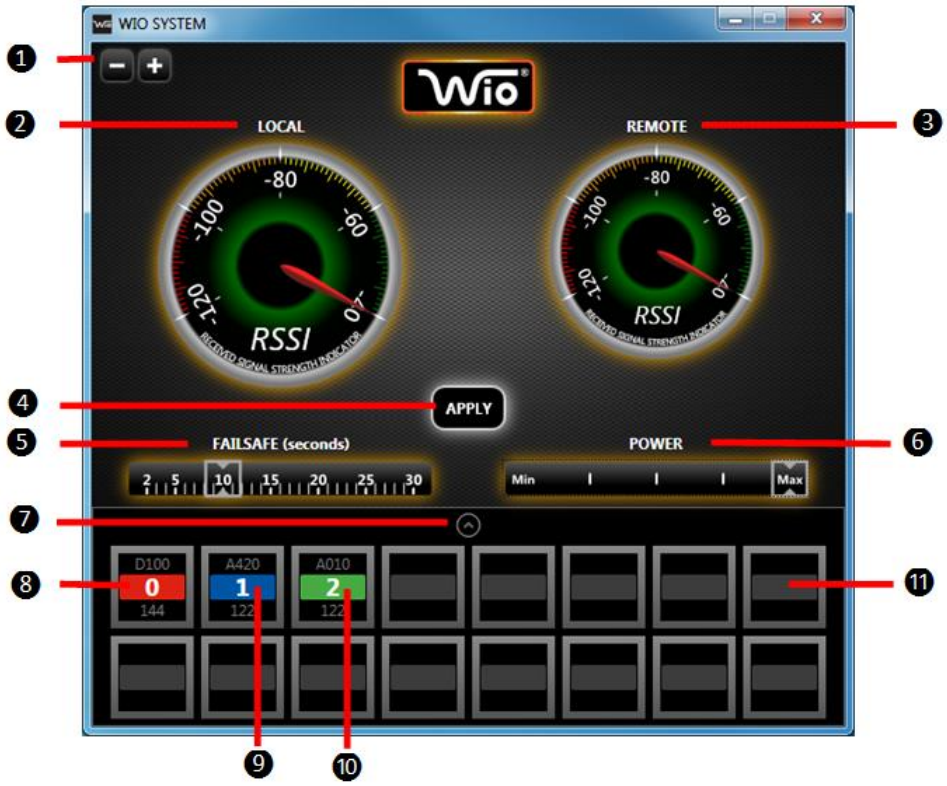



**ON / CONNECTED**

Click on **WIO®** button to view Radio Firmware Version, Radio Model, and Software Version.

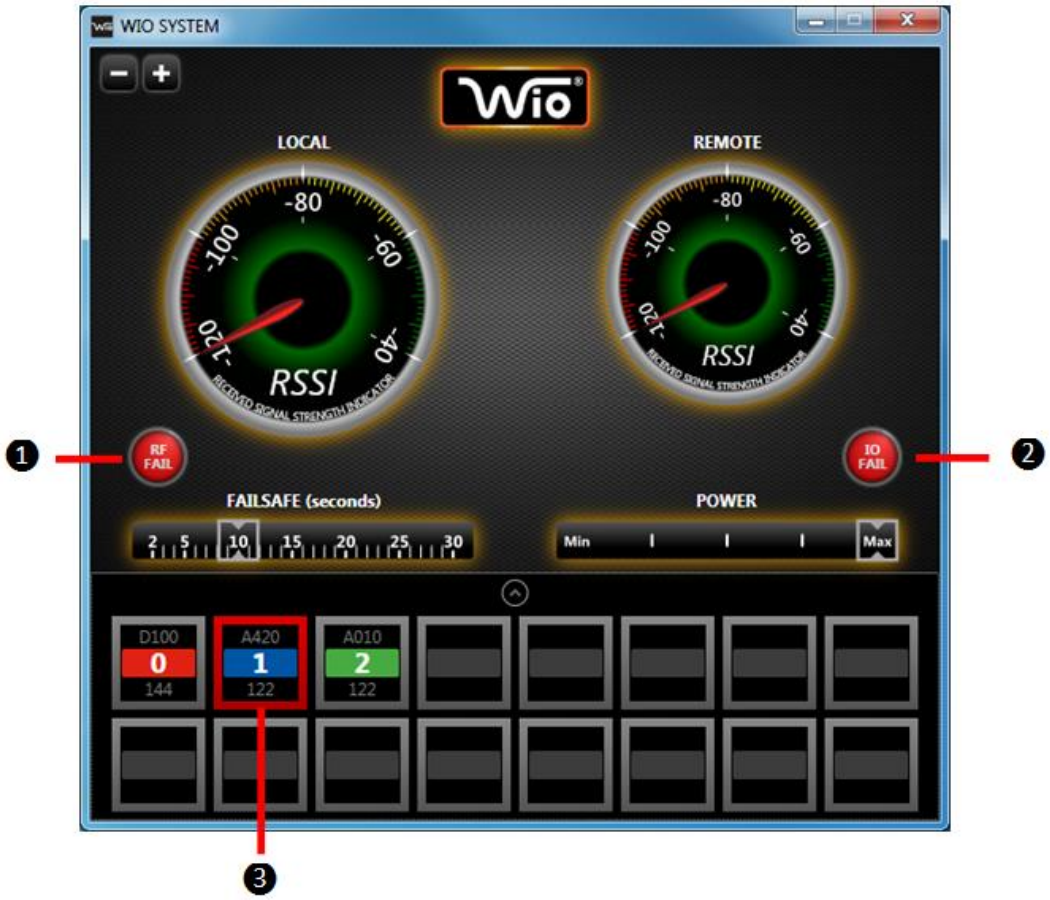


## 9.4 Main Window Guide



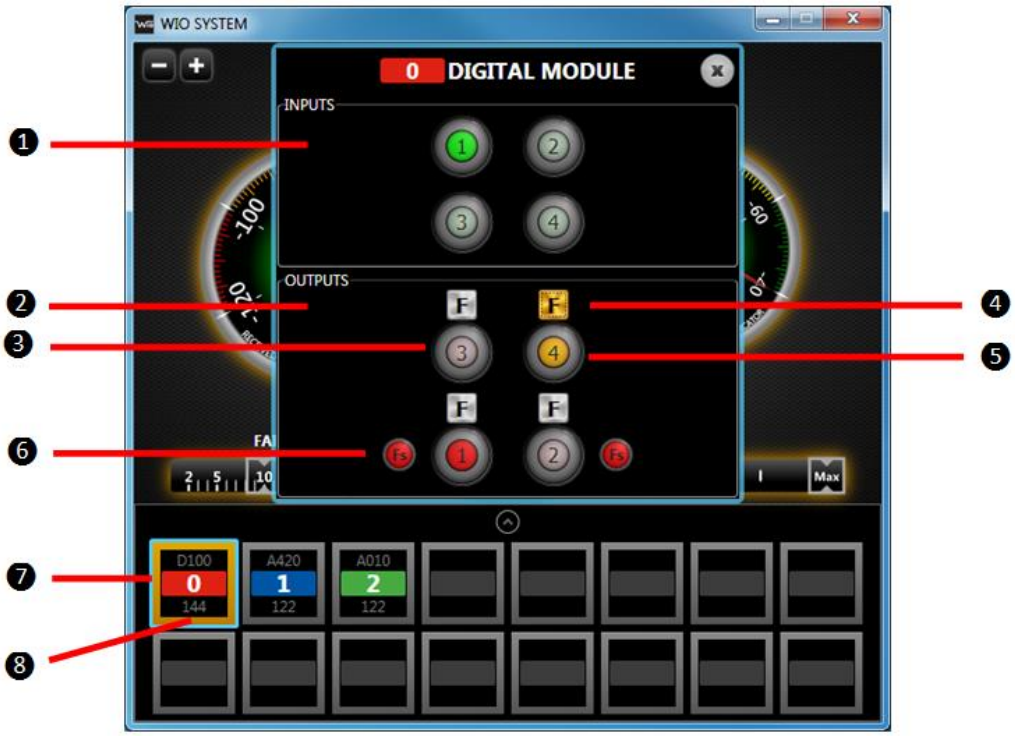

1. Screen Size – Zoom In/Out
2. Local RSSI (Received Signal Strength Indicator)
   a. This level indicates the incoming signal strength received from remote Radio.
3. Remote RSSI
   a. This level indicates the outgoing signal strength from local Radio to remote Radio.
   b. Adjusting Transmit Power will impact Remote RSSI.
4. Apply button – Appears when any setting is modified. Must click Apply in order for any changes to become effective on the local device.
5. RF Link Alarm Output and Operating in FailSafe mode is triggered by this RF timeout interval.
   a. 10-second default RF timeout (1-second increments: 2 to 30 second range).
6. Transmit Power Adjustor – for optimization of power level and power consumption.
7. I/O Module Tray – this tray displays all connected I/O Modules - use the arrow button to expand or minimize I/O Module Tray view.
8. Green color code indicates 0-10 V Analog Module.
9. Blue color code indicates 4-20 mA Analog Module.
10. Red color code indicates Digital Module.
11. Empty Module Slot

## 9.5 Additional Diagnostics



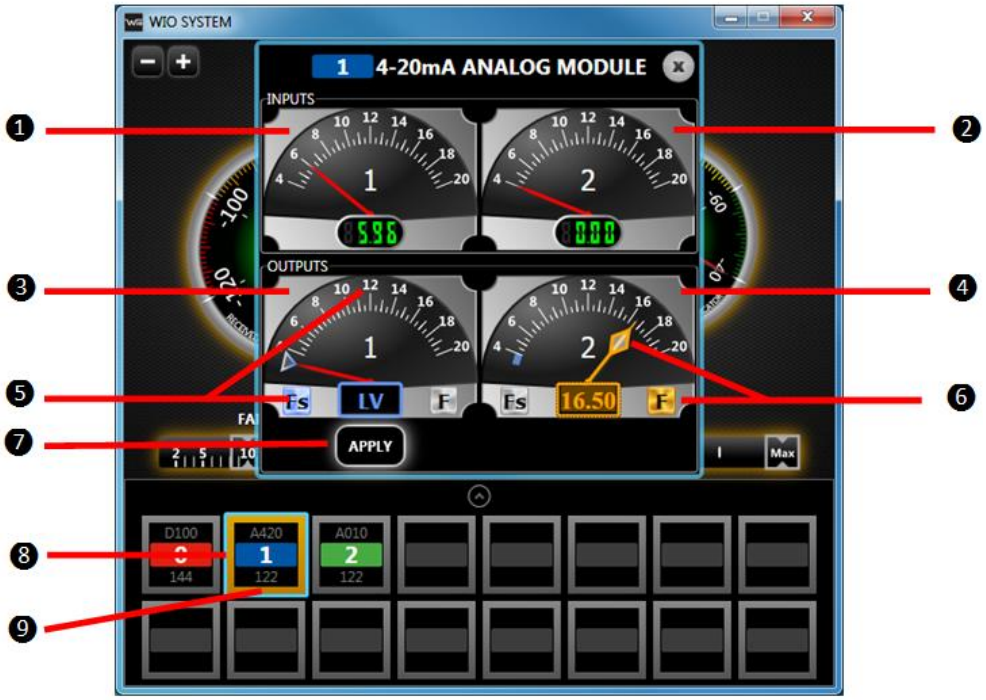

1. RF Link Failure Indicator
   a. The RF Link Fail Output (NPN) is triggered when RF link failure occurs.
2. I/O Link Failure Indicator
   a. The I/O Link Fail Output (NPN) is triggered when I/O link failure occurs.
3. Red Border I/O Link Failure Indicator
   a. Indicates the specific Module that has failed or is mismatched.

## 9.6 Digital Module Window Guide



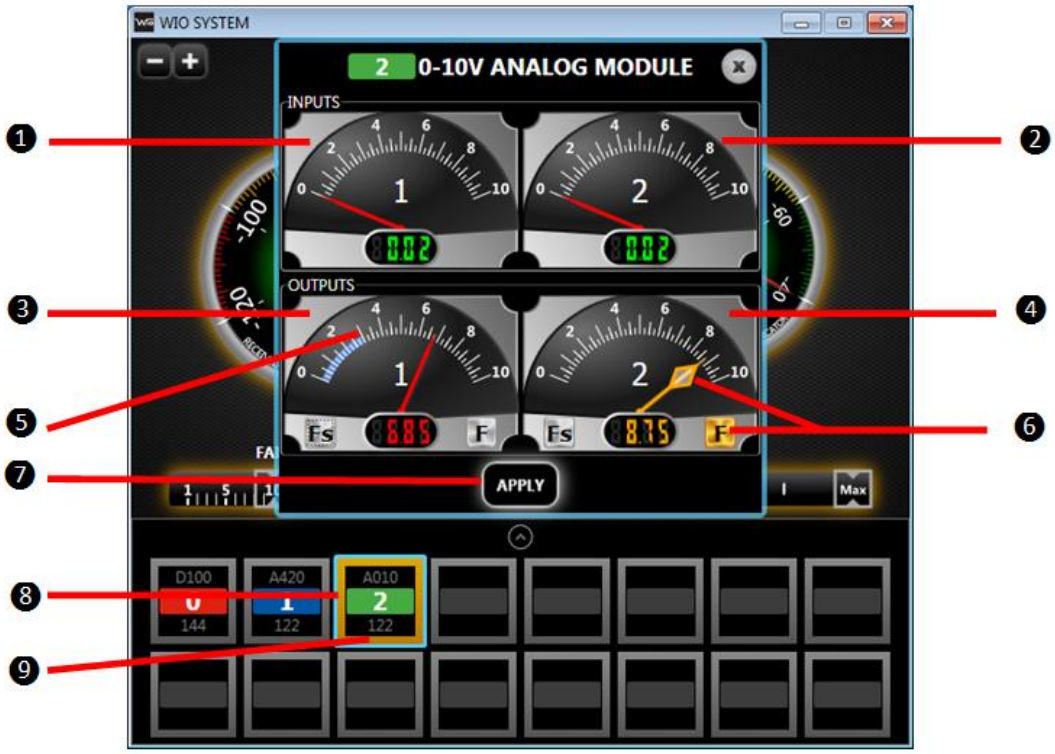

1. Digital Input(s) Status: Green = On ; Dimmed = Off
2. Digital Output(s) Status
3. Red LED: displayed when output is normally operated; Dimmed = Off
4. Force Output Button – click the “F” button
   a. Once activated, the user has the option of turning output on or off by pressing on virtual output buttons.
   b. To disable forcing an output, click “F” again to deactivate force mode.
   c. Closing the User Interface or unplugging the mini USB cable will automatically deactivate any forced output(s).
5. Orange LED: displayed when output is forced on.
6. Displays FailSafe mode that has been set using DIP Switches located on the Digital Module.
   a. In the example shown, DO 1 output will turn on when RF or I/O link fail detected (Fs indication on).
   b. DO 2 output will turn off when RF link fail detected (Fs indication off).
   c. DO 3 and 4 will output last known value when RF link fail detected (No Fs indication).
7. Blue border indicates selected I/O Module.
8. Orange border indicates forced output is active.

## 9.7 4-20 mA Module Window Guide




1. Input 1 Status
2. Input 2 Status
3. Output 1 Status (Red Needle)
4. Output 2 Status (Red Needle)
5. FailSafe
   a. Without the User Interface (default), the output reports last known value when RF or I/O failure occurs.
   b. Click the “Fs” button and a specific value can be assigned for output when RF failure occurs: Use the Blue Triangle needle to set a specific value. Set value is indicated in blue on dial and numeric display including last known value.
   c. Apply button – must click apply for changes to take effect.
6. Force Output Button
   a. Click “F” button to manually force a specific output. Forcing an output bypasses normal signal: Use the Yellow needle for adjustment.
   b. To disable forcing an output, click “F” again to deactivate force mode.
   c. Closing the User Interface or unplugging the mini USB cable will automatically deactivate any forced output(s).
7. Apply button – must click in order for changes to take effect.
8. Blue border indicates selected I/O Module.
9. Orange border indicates forced output is active.

## 9.8 0-10 V Module Window Guide




1. Input 1 Status
2. Input 2 Status
3. Output 1 Status (Red Needle)
4. Output 2 Status (Red Needle)
5. FailSafe
   a. Without the User Interface (default), the output reports last known value when RF or I/O failure occurs.
   b. Click the “Fs” button and specific value can be assigned for output when RF or I/O failure occurs: Use the Blue Triangle needle to set specific value. Set value is indicated in blue on dial and numeric display.
   c. Apply button – must click apply for changes to take effect.
6. Force Output Button
   a. Click the “F” button to manually force a specific output. Forcing an output bypasses normal signal: Use the Yellow needle for adjustment.
   b. To disable forcing an output, click “F” again to deactivate force mode.
   c. Closing the User Interface or unplugging the mini USB cable will automatically deactivate any forced output(s).
7. Apply button – must click in order for changes to take effect.
8. Blue border indicates selected I/O Module.
9. Orange border indicates forced output is active.

# 10 Frequently Asked Questions

1. What does the Wireless I/O System do?
   a. It allows replacement of hardwires.
   b. Point-to-point / bi-directional system.
   c. Eliminate trenching and running conduit.
   d. Ultimately helps save money and time.
   e. It's easy to use.

2. What type of I/O's are available?
   a. Digital/discrete
   b. Analog 4-20 mA
   c. Analog 0-10 V

3. Does Wireless I/O System follow a certain communication protocol?
   a. No, it's simply an I/O mirroring solution. What comes in is what goes out.
   b. It does not speak Modbus or any other protocol.
   c. Inputs received are replicated on the end of the radio spectrum as outputs.

4. Does Wireless I/O System require any software for programming or configuration?
   a. No, it requires absolutely no software. It is ready out of the box to install.

5. Is Wireless I/O offered in 900 MHz license-free ISM band?
   a. Yes, both US and International versions are available.

6. Is Wireless I/O offered in 2.4 GHz license-free ISM band?
   a. Yes, both US and International versions are available.

7. At max RF power of 250 mW, what is the expected RF range?
   a. Up to 4 miles using 900 MHz
   b. Up to 1 mile using 2.4 GHz (65 mW)

8. Does the Wireless I/O System support point-to-multipoint communication?
   a. The Radios come paired and secured and is meant for point-to-point applications only.

9. How much power does Wireless I/O Modules consume?
   a. Radio 35 mA @ 12 VDC AVG (10% Duty Cycle)
   b. Digital 26 mA @ 12 VDC MAX
   c. 4-20 mA 82.5 mA @ 12 VDC MAX
   d. 0-10 V 58 mA @ 12 VDC MAX

10. How many I/O modules can be connected to a Radio Module?
    a. It depends on the type and number of Modules.
    b. Please use the Power Budget Calculator to determine maximum I/O Module capacity per Radio when using more than five (5) I/O Modules. http://psft.com/A5D

11. How many I/O modules can be connected with the standard DataRail (6.1") shipped with Radio Kit?
    a. Standard DataRail supports up to five (5) I/O modules in addition to one Radio module.

12. How do I setup each I/O module once connected to the Radio module?
    a. Use a small flat screwdriver (technician's screwdriver) and turn ID switch to select desired ID number.
    b. Be sure the matching module at the other Radio station is also assigned to the same device ID.

13. Does the Radio module automatically detect new I/O modules when connected to DataRail?
    a. Yes, but only during hardware reset by power cycling the Radio module.

14. What is the mini USB port on the Radio module used for?
    a. The mini USB port is designated to plug in a PC running Wireless I/O Software Tool for users wanting to take full advantage of all the features the Wireless I/O System has to offer.

15. What types of features are available with the Wireless I/O Advance User Interface?
    a. Perform RF strength test (RSSI), change RF channel, adjust RF power level to balance power consumption and performance, change RF timeout interval, force local outputs, or set FailSafe settings for Analog outputs.

16. Can the Wireless I/O System be used in hazardous locations?
    a. Yes, the system can be used in Class 1, Division 2 or Zone 2 locations.

17. Can Radio modules be reprogrammed?
    a. Radio Module firmware can be upgraded when updates become available via mini USB port.
    b. For security reasons, once two Radio modules are paired together from factory, they cannot be unpaired.

18. Is the Wireless I/O System compatible with Wireless HART protocol?
    a. No, the Wireless I/O System is a proprietary RF protocol developed to provide superior reliability and ease of use for the sake of replacing conduit and wires.

19. In case of an emergency, how can I manually force the Wireless I/O System into FailSafe condition for managing outputs (ESD)?
    a. Radio Module provides a discrete input for connecting a dry contact switch
    b. When dry contact is closed or active, Radio Module will instantly operate in the FailSafe mode.
    c. User can configure the Discrete Module by manipulating the FailSafe dip switches located directly on the device.
    d. Analog Modules defaults to last known value. The Advanced UI, the FailSafe output point can be set to any value.

20. In the unlikely event my Radio Module gets damaged, can I just buy one module to replace into my system?
    a. No. Since the Radio Modules are a fixed pair system, a new pair of Radio Modules is needed for replacement.

21. In the unlikely event one of my I/O Module gets damage, can I just buy one module to replace into my system?
    a. Yes. You do not need to purchase it in pairs like the Radio Modules. I/O Modules are sold as singles and pairs to fit your need.

22. How can I obtain tech support or RMA?
    a. Please email us at support@prosoft-technology.com or give us a call to begin the service process. You will be guided by our helpful customer service staff member to help you get through any issue you are having with the Wireless I/O System.

# 11 Support, Service & Warranty

ProSoft Technology, Inc. (ProSoft) is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

1. Product Version Number
2. System architecture
3. Network details

If the issue is hardware related, we will also need information regarding:

1. Module configuration and associated ladder files, if any
2. Module operation and any unusual behavior
3. Configuration/Debug status information
4. LED patterns
5. Details about the serial, Ethernet or fieldbus devices interfaced to the module, if any.

**Note:** *For technical support calls within the United States, an after-hours answering system allows 24-hour/7-days-a-week pager access to one of our qualified Technical and/or Application Support Engineers. Detailed contact information for all our worldwide locations is available on the following page.*

| | |
|---|---|
| **Internet** | Web Site: www.prosoft-technology.com/support<br>E-mail address: support@prosoft-technology.com |
| **Asia Pacific**<br>(location in Malaysia) | Tel: +603.7724.2080, E-mail: asiapc@prosoft-technology.com<br>Languages spoken include: Chinese, English |
| **Asia Pacific**<br>(location in China) | Tel: +86.21.5187.7337 x888, E-mail: asiapc@prosoft-technology.com<br>Languages spoken include: Chinese, English |
| **Europe**<br>(location in Toulouse, France) | Tel: +33 (0) 5.34.36.87.20,<br>E-mail: support.EMEA@prosoft-technology.com<br>Languages spoken include: French, English |
| **Europe**<br>(location in Dubai, UAE) | Tel: +971-4-214-6911,<br>E-mail: mea@prosoft-technology.com<br>Languages spoken include: English, Hindi |
| **North America**<br>(location in California) | Tel: +1.661.716.5100,<br>E-mail: support@prosoft-technology.com<br>Languages spoken include: English, Spanish |
| **Latin America**<br>(Oficina Regional) | Tel: +1-281-2989109,<br>E-Mail: latinam@prosoft-technology.com<br>Languages spoken include: Spanish, English |
| **Latin America**<br>(location in Puebla, Mexico) | Tel: +52-222-3-99-6565,<br>E-mail: soporte@prosoft-technology.com<br>Languages spoken include: Spanish |
| **Brasil**<br>(location in Sao Paulo) | Tel: +55-11-5083-3776,<br>E-mail: brasil@prosoft-technology.com<br>Languages spoken include: Portuguese, English |

## 11.1 Warranty Information

For complete details regarding ProSoft Technology's TERMS & CONDITIONS OF SALE, WARRANTY, SUPPORT, SERVICE AND RETURN MATERIAL AUTHORIZATION INSTRUCTIONS please see the documents on the Product DVD or at www.prosoft-technology.com/warranty.

All documentation is subject to change without notice.